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April 15, 2004

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *In the Matter of Petition for Forbearance of the Verizon Telephone Companies*, CC Docket No. 01-338; *In the Matter of SBC Communications Inc.'s Petition for Forbearance Under 47 U.S.C. § 160(c)*, WC Docket No. 03-235; *In the Matter of Qwest Communications International Inc. Petition for Forbearance Under 47 U.S.C. § 160(c)*, WC Docket No. 03-260

Dear Mr. Dortch:

I am writing in response to the March 29, 2004 *ex parte* letter and accompanying declaration of Jerome Holland filed by Verizon in the above captioned proceeding. In this filing, Verizon makes sweeping claims regarding the purported "costs" of unbundling Verizon's so-called "Fiber-to-the-Premises" ("FTTP") deployment. These claims do not withstand scrutiny.

Before turning to the specific shortcomings with Verizon's technical claims, three points deserve emphasis at the outset. First, Verizon's claims pertain only to the difficulties of unbundling FTTP. By implication, Verizon is conceding that unbundling of existing hybrid fiber-copper loops – which are the fiber loops that have actually been deployed in Verizon's network to date and that are at the heart of Verizon's petition – can easily be accomplished.

Second, Verizon concedes that it has already signed the contracts with vendors to implement its FTTP program.¹ And at the time these contracts were inked, Verizon knew full well that it was subject to the unbundling obligations of section 271. Likewise, despite the

¹ Holland Dec. ¶ 6.

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existence of these obligations, Verizon had no problem funding the billions of dollars it says it will invest in FTTP.² Thus, there can be no credible claim that existing section 271 unbundling obligations have undermined Verizon's incentive to invest in FTTP technology.

Third, Verizon's claim that it is technically impossible to unbundle FTTP is expressly contradicted by its advocacy in this proceeding. In contending that the Commission should eliminate access to "broadband" loops under section 251(c), Verizon assured the Commission that Verizon would still offer competitive carriers access to those loops under "voluntary" market arrangements.³ Mr. Holland repeats that claim at the very end of his declaration.⁴ There is simply no way to reconcile these assurances with Verizon's claim now that it is not technically feasible to "accommodate access by multiple carriers" to FTTP.⁵ Whether it is technically feasible to provide multiple carriers access to FTTP certainly does not depend upon whether the access is mandated by regulation or voluntary.⁶

More fundamentally, however, Verizon's claims of technical infeasibility are a contrivance. As Mr. Mollica explains, the entirety of Mr. Holland's technical infeasibility argument boils down to the proposition that the Optical Line Terminals ("OLTs") used in Verizon's FTTP deployment currently are not designed to provide access to multiple customers and therefore unbundling is not feasible.⁷ Mr. Holland does not provide any support for this assertion. But even if Mr. Holland's claims about OLTs were true, it is still quite straight-

² Steven Rosenbush, *Verizon's Gutsy Bet*, Business Week (August 4, 2003), at 53-55 (quoting Verizon's CEO as stating that "*funding is not an issue*" for this project).

³ *Triennial Review Order*, 18 FCC Rcd. 16978, ¶ 253 & n.755 (2003).

⁴ Holland Dec. ¶ 24.

⁵ Holland Dec. ¶¶ 15, 18.

⁶ Verizon's prior advocacy in this proceeding also disposes of its claim that "regulation" of its FTTP under section 271 will create "uncertainty" that will retard its investment. *Id.* ¶ 23. In any event, the very same "wholesale" offerings that Verizon says it will "voluntarily negotiate" would be subject to section 201 and 202 even in the absence of any section 271 unbundling obligation. Thus, Verizon's forbearance request has nothing to do with this "uncertainty" but can only be aimed at eliminating any obligation to provide wholesale access to its fiber.

⁷ Mollica Dec. ¶ 8. In Verizon's proposed FTTP architecture, a fiber loop runs from the OLT in the central office to an optical network terminal at the customer's premises. The OLT is in turn directly connected to an ATM switch that likewise would reside at the central office. The purpose of the ATM switch is to establish a permanent virtual circuit between the end points of the loop. Thus, the ATM switch effectively acts as a cross-connect and directs the packets to facilities that perform traditional switching functions – either Verizon's Gateway router or a class 5 switch. *Id.* ¶¶ 5-6, 10.

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forward to provide competitive carriers unbundled access to the local loop. As Mr. Mollica explains, Verizon can provide unbundled access at the ATM switch that subtends the OLT.⁸

Presumably, Mr. Holland does not address the ease with which unbundling can be provided at the ATM switch because of Verizon's stated position that such switches do not need to be provided as unbundled network elements under section 251(c)(3). That is no basis for denying competitive carriers access to the loops at issue here, which is governed by section 271(c)(2)(B). The "competitive checklist" requires Bell operating companies such as Verizon to provide both loops and switches, *without any qualification*. Thus, even to the extent that the ATM switch that is directly connected to Verizon's last-mile fiber is a "switch" under section 271(c)(2)(B)(vi) rather than part of "local loop transmission from the central office to the customer's premises" under section 271(c)(2)(B)(iv), Verizon must provide access to the ATM switch. Further, the terms of such access are governed by sections 201 and 202⁹ and, as the Supreme Court held in *Iowa Utilities Board*, it would constitute unreasonable and discriminatory "sabotage" for Verizon to refuse to provide these facilities in their current combined form.¹⁰

In all events, the ATM switch is part of the local loop in this configuration, and does not perform a "switching" function. "The local loop network element is defined as a transmission facility between a distribution frame (*or its equivalent*) in an incumbent LEC central office and the loop demarcation point at an end-user customer premises."¹¹ As Mr. Mollica explains,¹² the ATM switch is "the equivalent" of the distribution frame in this architecture. It is the first point at which individual loops can be accessed and it is the point at which transmission signals are directed to either Verizon's IP network or its circuit switch. In this regard, the ATM switch is analogous to the multiplexer function of IDLC loops that the Commission determined are part of the loop in the *Local Competition Order*.¹³ Thus, to activate the capabilities of the FFTP being provided, competitive carriers would need to deploy their own circuit switches or packet switches.¹⁴

⁸ *Id.* ¶ 9.

⁹ *Triennial Review Order* ¶ 656.

¹⁰ *Iowa Utilities Board v. FCC*, 525 U.S. 366, 394 (1998). In so holding, the Supreme Court made clear that the term "unbundled" in the Telecommunications Act does not mean that elements are to be provided "in discrete pieces" but rather be available at "separate prices." *Id.*

¹¹ 47 C.F.R. § 51.319(a)(1) (emphasis added); *see also Local Competition Order*, 11 FCC Rcd. 15499, ¶ 379 (1996).

¹² Mollica Dec. ¶ 10.

¹³ *Local Competition Order* ¶ 383.

¹⁴ Mollica Dec. ¶ 10.

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Verizon and Mr. Holland also contend in conclusory fashion that unbundling would substantially increase the costs of OSS and decrease its efficiency.¹⁵ Mr. Holland states: “Verizon alone already has spent hundreds of millions of dollars in modifying existing systems to handle unbundling requirements for narrowband network elements. For broadband, we would essentially have to duplicate these systems, and incur the same type of costs, all over again.”¹⁶ This comparison cannot be taken seriously. The reason why the initial modifications to Verizon’s OSS was costly was because those systems had been designed from the ground up to be used only by Verizon. Thus, Verizon had to incur the costs of changing single-carrier systems to systems designed to interface with multiple carriers. Now, however, Verizon has in place multi-carrier OSS and Verizon is presumably building on its existing OSS to support its new product offering.¹⁷ Further, Verizon has the ability now to design its new OSS “from the ground up” and avoid the problems of having to retrofit a system that was designed only for one carrier.

But even if it were both “costly” to design a multi-carrier OSS – and such costs were relevant to satisfying the section 10 forbearance criteria that focus whether Verizon would have the ability to exercise market power in wholesale and retail markets – it would still not follow that such imagined costs provide a basis for forbearance. Independent of any unbundling obligations imposed by section 271 (or section 251(c)(3)), Verizon is required by section 251(c)(4) to resell services it provides over its FTTP. Thus, Verizon will necessarily have to develop multi-carrier OSS in this context to handle resale orders.

Finally, Mr. Holland speculates that section 271 unbundling obligations may in the future impose substantial costs on Verizon.¹⁸ Such speculation about future unbundling costs is clearly no basis for forbearing today from unbundling obligations. To the extent that

¹⁵ Of course, the Commission cannot justify a finding of forbearance on such vague and unsubstantiated claims about the “costs” of unbundling. First Report and Order, *Forbearance from Applying Provisions of the Communications Act to Wireless Telecommunications Carriers*, 15 FCC Rcd. 17414 ¶ 13 (2000) (“In determining when to forbear from applying specific statutory or regulatory provisions, our goal, consistent with sound public policy and Congressional intent, is to deregulate whenever the operation of competitive market forces is capable of rendering regulation unnecessary. At the same time . . . the decision to forbear from enforcing statutes or regulations is not a simple decision, and must be based upon a record that contains more than broad, unsupported allegations of why the statutory criteria are met.”); *WorldCom, Inc. v. FCC*, 238 F.3d 449, 459 (D.C. Cir. 2001) (A request that seeks “the forbearance of dominant carrier regulation under Section 10” demands “a painstaking analysis of market conditions” supported by empirical evidence).

¹⁶ Holland Dec. ¶ 18.

¹⁷ Notably, Mr. Holland makes no claim that Verizon is building all new OSS to support FTTP.

¹⁸ Holland Dec. ¶ 21.

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Verizon's fears come true, Verizon can petition the Commission for forbearance at that time on the basis of actual facts, not conjecture.

Sincerely,

/s/ C. Frederick Beckner III

C. Frederick Beckner III

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

<hr/>)	
In the Matter of)	
)	
Petition for Forbearance of the Verizon)	CC Docket No. 01-338
Telephone Companies)	
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**EX PARTE DECLARATION OF SCOTT MOLLICA
ON BEHALF OF AT&T CORP.**

1. My name is Scott J. Mollica. I am a Principal Technical Staff Member in the Local Networks Technology Group of AT&T Laboratories ("AT&T Labs"). I joined AT&T Labs in 1995 and have been involved with AT&T's entry into local markets since joining the company. Prior to joining AT&T, I was a research engineer at the Department of Defense. At AT&T, I have held various Systems Engineering, Testing and Development positions. In the course of my employment with AT&T, I have been involved with a number of projects relating to AT&T's local service strategy, including Digital Loop Carrier/DSL Line Access Manager testing and certification and end-to-end certification of Voice-over-Packet (IP/ATM) gateways for the AT&T's local network. Currently, my principal area of responsibility is supporting AT&T's efforts to ensure the quality of services provided over IP networks.

2. I am a subject matter expert in GR-303 Digital Loop Carrier Technology. I also have experience with IP and ATM networks. I also participate in standards activities as they pertain to DSL and local access. In this regard, I am an active member of the DSL Forum, which is comprised of industry and academic participants that define specifications for current and next generation DSL networks.

3. I hold a Bachelors degree in Electronics Engineering from Rutgers University and a Masters degree in Software Engineering from Monmouth University.

4. The purpose of my declaration is to respond to the declaration of Mr. Jerome Holland filed in the above-captioned proceeding. In that declaration, Mr. Holland claims that any “unbundling requirement” with respect to Verizon’s planned deployment of fiber-to-the-premises (“FTTP”) would necessarily involve “a costly redesign of the network and associated systems.” Holland Dec. ¶ 15. Before explaining why Mr. Holland’s claims are incorrect as a matter of basic systems engineering principles, it is first necessary to provide a little background on the architecture Verizon plans to use in deploying FTTP loops (background that Mr. Holland omits in his declaration).

5. Verizon’s FTTP deployment is based on ITU-T G.983 standards compliant Broadband Passive Optical Network (“BPON”). A BPON network uses an underlying ATM network to transport voice and high-speed data services. As I understand it, Verizon plans to deploy “passive” fiber loops from its central offices to the customer premises. At the premises, these loops would connect to an optical network terminal (“ONT”). The ONT provides an interface between the passive optical network and the customer premises. In general, the ONT can be considered an ATM access multiplexer. The purpose of the ONT is to convert subscriber voice and Internet data traffic into ATM cells for transportation over the passive optical network. At the central office, the loops are connected to an optical line terminal (“OLT”). The purpose of the OLT is to aggregate voice and Internet data traffic from multiple subscribers. The OLT supports an optical subscriber interface and an optical network interface.

6. The OLT, however, is not the end of the loop. The OLT is connected directly to an ATM switch. To a large extent, referring to the ATM device as a “switch” is a misnomer.

The ATM switch does not make any routing decision. Rather, the ATM switch aggregates traffic, in the form of permanent virtual circuits (“PVCs”), from multiple OLT systems and establishes PVCs between two points on the loop – here, the ONT and either a traditional Class 5 Circuit switch (for voice circuits) or a gateway router (for data circuits). Unlike packet switching, which performs a traditional routing function, ATM cells contain address information (*e.g.*, virtual path or channel identifier (VPI/VCI)) that directs the ATM cell traffic along a prescribed route (which does not vary), toward an appropriate destination. Thus, in the FFTP scenario envisioned by Verizon, the ATM switch forwards the ATM cells delivered by the end-user to the destination device that provides the switching intelligence – in this case, either a traditional Class 5 Circuit switch or a gateway router for Internet access.

7. To illustrate this configuration, I attach hereto technical specifications published by Alcatel, an equipment manufacturer that supports this technology, for FFTP.

8. Although Mr. Holland provides little detail as to why unbundling of FFTP is not possible, the basis for his claim appears to be that the ONT and OLT equipment that Verizon plans to deploy are not capable of supporting multiple carrier access. Holland Dec. ¶ 15. Verizon does not provide any evidence of this fact but, more importantly, even if that were true, it does not follow that multiple carrier access is difficult to accommodate, or that ONTs and OLTs would have to be redesigned to support such access. The ONT or OLT is not the only point at which competitive local exchange carriers (“CLECs”) can access the local loop. CLECs can also interconnect at the port on the ATM switch (just as Verizon accesses the FFTP loop at that point), after the ATM cell has passed through the OLT.

9. Notably, Mr. Holland provides no explanation as to why interconnection at the ATM is infeasible. And while I do not have access to the full technical specifications of

Verizon's planned network, in my expert view, existing ATM switches would permit multiple carrier access. As explained above, ATM cells contain address information that directs the ATM cells to a particular port on the ATM switch, and that address information could as easily correspond to a port assigned to a CLEC as one belonging to Verizon. In a multiple service provider scenario, the ATM circuits would simply be cross-connected to a physical interface port located on the ATM switch, which is assigned to the CLEC. For example, nothing in the Alcatel specifications, which encompass standards-based technology (such as a GR 303 gateway and G.983 compliant BPONs), support the notion that this type of interconnection would require the re-design of vendor equipment. Indeed, because vendor equipment has been moving in the direction of embracing open standards to promote this type of network, I have no reason to believe that multiple carrier access to FTTP networks would require network modifications.

10. Implicit in Mr. Holland's declaration is the notion that the ATM-based FTTP architecture now being contemplated by Verizon involves "packet switching" in the loop plant. As I explained above, the ATM switch here does not make any routing decisions. Rather, in the FTTP architecture, the ATM switch is really a multiplexer and a cross-connection point of the loop, because it is the point at which access to individual end-users signals is possible. Because that is the function of the ATM switch, the ATM switch performs a role that is similar to that performed by Digital Cross-Connection Systems, not that performed by traditional switches. Thus, just as with access to "traditional" loops, should competitive carriers be granted the ability to access the FTTP loops at the ATM port, they would need to backhaul traffic to their network and provide the circuit and packet switching used to provide dial tone, Internet access and other functionalities.

11. In short, I have not seen any evidence to suggest that multiple carrier access to Verizon's FTTP would be technically infeasible, and my belief is that such access can readily be accomplished.

I hereby declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge, information, and belief.

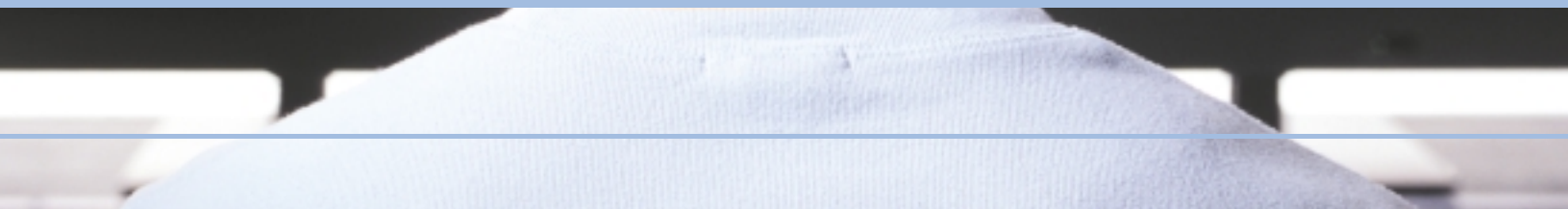
/s/ Scott J. Mollica

April 15, 2004



Alcatel 7340 FTTU

Fiber to the User



**Enhanced Revenue Potential
With Optical Broadband**

**Release 1.0 ANSI (FGH1.0)/
Release 1.0 ETSI (FGE1.0)**



ARCHITECTS OF AN INTERNET WORLD



The Alcatel 7340 FTTU is an all-optical access solution that helps service providers maximize revenues from the residential market. It provides a superior platform for bundled services and serves a range of FTTU applications including residential, small office/home office (SOHO), multiple dwelling unit (MDU), and small business. Operators can offer any service mix with increased reliability and lower maintenance costs.

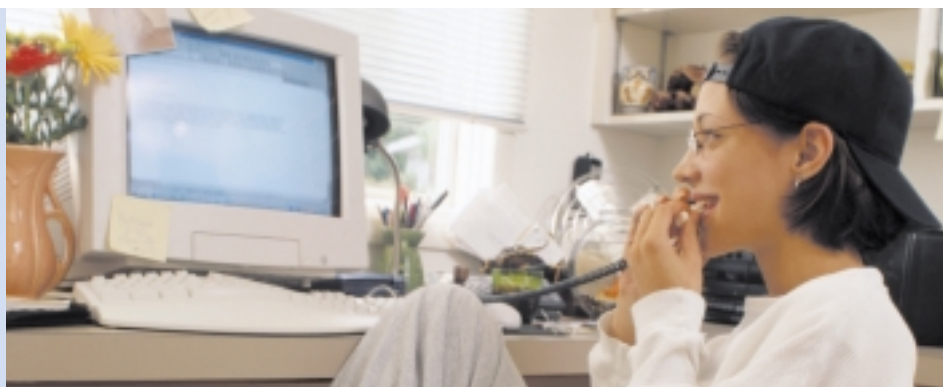


THE UNLIMITED POSSIBILITIES OF OPTICAL BROADBAND

The Unlimited Possibilities of Optical Broadband
In today's residential access market, service providers have a greater opportunity for revenue generation than ever before. Consumers are purchasing increasing amounts of communications and home entertainment services, with combined monthly expenditures often exceeding \$100 U.S. The Alcatel 7340 Fiber to the User (FTTU) product family enables our customers to capture this revenue and offer even more services in the future. The Alcatel 7340 FTTU offers the performance capabilities and enhanced network reliability made possible with fiber optics, coupled with the cost-effective architecture and flexibility of passive optical networking (PON).

Leveraging our industry-leading digital subscriber line (DSL) and next generation digital loop carrier (NGDLC) product experience, Alcatel has built the Alcatel 7340 FTTU to provide our customers with an all-optical access solution. With the Alcatel 7340 FTTU, Alcatel provides a complete system solution that gives service providers the full service access network they need to maximize and maintain revenue from their residential market. The same technology can also support services to small businesses, allowing the operator easy access to this additional revenue opportunity.

In terms of capacity and service growth potential, the capabilities of the optical network are virtually unlimited



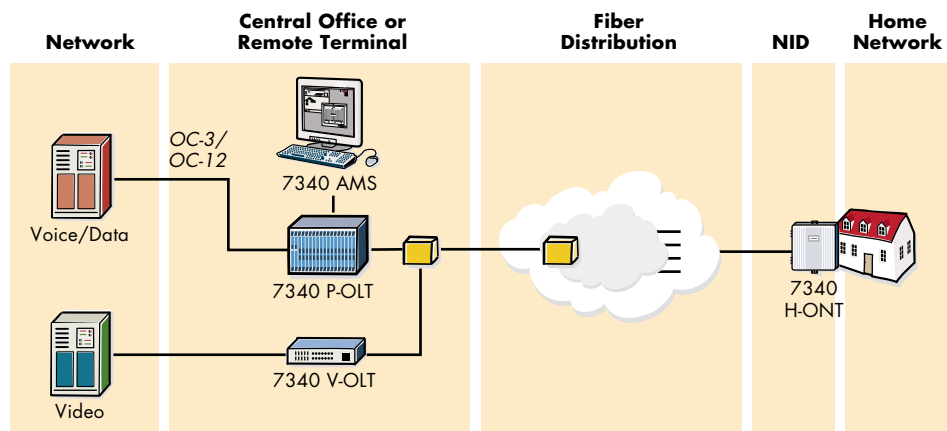
The Alcatel 7340 FTTU leverages Alcatel's industry-leading DSL and NGDLC lineage

Figure 1 illustrates the elements of the Alcatel 7340 FTTU system.

The Alcatel 7340 FTTU delivers:

- > Interactive video services using cable TV (CATV), supporting hundreds of analog, digital and HDTV channels
- > Broadband data access: 40 Mb/s per subscriber with even higher bursting rates
- > Four plain old telephone service (POTS) lines with lifeline support and toll-quality voice
- > Optical fiber all the way to the residence for increased reliability and reduced maintenance
- > All services over a single optical fiber for network fiber optimization

Figure 1: Elements of the Alcatel 7340 FTTU System





A **SCALEABLE** MULTIMEDIA SERVICE SOLUTION

The operator can offer any service mix customers demand, while reaping the benefits of increased reliability and lower maintenance expenses that an all-optical network provides

Features

The Alcatel 7340 FTTU is a scaleable multimedia service solution. Through a single network of passive fiber optics, it provides a superior platform for all the bundled services operators want to offer subscribers today and tomorrow.

Using broadband passive optical networking (BPON) technology, the Alcatel 7340 FTTU offers full service capability in a cost-effective deployment architecture. The system supports long reach from the central office (CO) to the home (up to 20 kilometers or 12.4 miles), which virtually eliminates the need for remote terminals. Each fiber supports up to 32 residential subscribers, allowing the cost of the fiber plant to be shared.

The Alcatel 7340 FTTU serves a range of fiber-to-the-user applications including residential, SOHO, multiple dwelling units, and small business. It offers functionality for all aspects of the broadband access network. The CO element supports all types of applications, while the elements that reside at the user site define the services and interfaces. This architecture provides significant flexibility to an operator, as one system can deliver broadband access to a wide range of customers.

Table 1 provides a list of features and benefits of the Alcatel 7340 FTTU.



Table 1: Features and Benefits of the Alcatel 7340

Feature	Function	Benefit
PON architecture	<ul style="list-style-type: none">• Completely passive outside plant• FSAN/ITU-T G.983 design• Single fiber solution• 32 subscriber split per fiber• 20 km (12.4 mile) reach• Robust ATM quality of service	<ul style="list-style-type: none">• Reduced maintenance expense• Increased network reliability• Standards-based components provide cost savings• Sharing of fiber for reduced network capital expenditure• QoS supports high quality services
ONT optimized for broadband residential service	<ul style="list-style-type: none">• Supports bundled services (voice, video, and data)• Hardened, low profile network interface device (NID)• Virtually unlimited capacity	<ul style="list-style-type: none">• Easily attracts new customers• Reduces customer churn• Maintains demarcation point outside house• Ensures support for future services
OLT designed to be flexible and scalable	<ul style="list-style-type: none">• Highly scalable• Residential and business services supported• Component commonality with 7300ASAM (shelf, NT interface and ACU), and 7301 ASAM is open to FTTH/PON access technology	<ul style="list-style-type: none">• Cost-effective for small deployments• Scales well to high density for large deployments• Different customer types supported on one system• Robust management system
Video services	<ul style="list-style-type: none">• CATV• DBS• Baseband (digital)• Broadcast video on demand (VoD)• HDTV	<ul style="list-style-type: none">• Competitive with MSO offerings• High capacity and flexibility for enhanced services• Multiple video deployment options• Increased revenue opportunity
Voice services	<ul style="list-style-type: none">• Toll-quality voice• Supports CLASS (caller ID, call waiting, voice messaging)• Fax machine support• Answering machine compatible	<ul style="list-style-type: none">• Subscribers' quality and reliability expectations fully met• Easily provisioned through Alcatel Element management systems• Flexible (four POTS lines)• Supports VoATM and VoIP
Data services	<ul style="list-style-type: none">• 10/100Base-T LAN• HPNA 1.0 – 10 Mb/s• Provisionable bandwidth	<ul style="list-style-type: none">• Very high speed data up to 40 Mb/s per subscriber• Simple installation and easy operator maintenance• HPNA runs on standard twisted-pair cabling

Through a single network of passive fiber optics, this solution provides a superior platform for all the bundled services operators want to offer subscribers today and tomorrow

Bundled Services

Data

Subscribers can have Internet access service levels ranging from 64 kb/s to 40 Mb/s. With 622/155 Mb/s asymmetrical service per fiber optic link, whether customers want a little or a lot, you can quench their bandwidth thirst and reap revenue accordingly.

Voice

The Alcatel 7340 FTTU supports carrier class voice service with up to four POTS lines per residential subscriber. The battery backup provides at least eight hours of lifeline support in the event of a power outage.

With toll-quality voice, support of CLASS services (such as caller ID, call waiting, and voice messaging), and fax and answering machine compatibility, the Alcatel 7340 FTTU provides a complete voice solution. Subscribers receive the high quality POTS service they expect, but operators have the flexibility and efficiency of using packetized voice. This includes voice terminating TDM GR-303 or TR-008 with software upgradeable hardware supporting voice over IP (VoIP).

Video

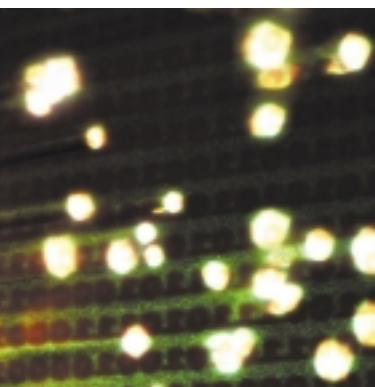
Using the video overlay capability of BPON technology, operators can offer more video options than ever before. Analog, digital video and HDTV services are supported, so basic CATV services can be offered without any set-top boxes, reducing the cost of video deployment. The full CATV spectrum from 40 – 850 MHz, can be carried over the fiber, so there is plenty of room for such enhanced video services as premium channels, pay-per-view, Video on



Demand, and other interactive services. This broad range opens up a large menu of new video services that can generate increased revenues for the operator. The video overlay has plenty of spare capacity, so digital satellite service (DSS) or digital baseband video can also be offered, providing even more service opportunities.

Today's video services are supported including, analog, digital set-top boxes and cable-ready TV sets. Tomorrow's TV sets, digital ready or HDTV cable ready, are supported with today's Alcatel 7340 H-ONT. All of these services are supported across a single strand of fiber with virtually unlimited bandwidth. Operators can offer a voice, data and video bundle today, secure in the knowledge that, as new services emerge, the FTTU network will be able to support them.

A network composed completely of fiber supports the services required today while positioning operators very well for the future



EXPANDING ON

ALCATEL'S **LEADING** BROADBAND ACCESS PORTFOLIO

Architecture

The Alcatel 7340 FTTU product suite includes:

- > Alcatel 7340 FTTU Packet Optical Line Terminal (P-OLT)
- > Alcatel 7340 FTTU Home Optical Network Terminal (H-ONT)
- > Alcatel 7340 FTTU Video Optical Line Terminal (V-OLT)
- > Alcatel Element Management System (AMS/ANSI or AWS, WAM/ETSI)
- > Outside plant

Within this flexible architecture, the Alcatel 7340 FTTU solution allows operators to offer a wide range of broadband services.

Alcatel 7340 FTTU P-OLT

The Alcatel 7340 P-OLT concentrates and grooms all BPON traffic and provides the subscriber side and network side interfaces.

The Alcatel 7340 P-OLT shares common components with the industry-leading Alcatel 7300 Advanced Services Access Manager (ASAM), which is field proven as an outstanding platform for the access portion of the network. The Alcatel 7340 P-OLT is very scalable, allowing a partially populated system to be deployed to support a small population of subscribers cost-effectively.



Each P-OLT BPON interface can be split to support 32 H-ONTs, providing a high density of subscribers in a single shelf. When combined with Alcatel BPON QoS and traffic management features, the Alcatel 7340 P-OLT can be oversubscribed to fully use the network interfaces in the most efficient manner. The P-OLT has a single OC-3c/STM-1 interface (redundant), and is upgradeable to OC-12c/STM-4. Figure 2 illustrates the Alcatel 7340 FTTU BPON technology.

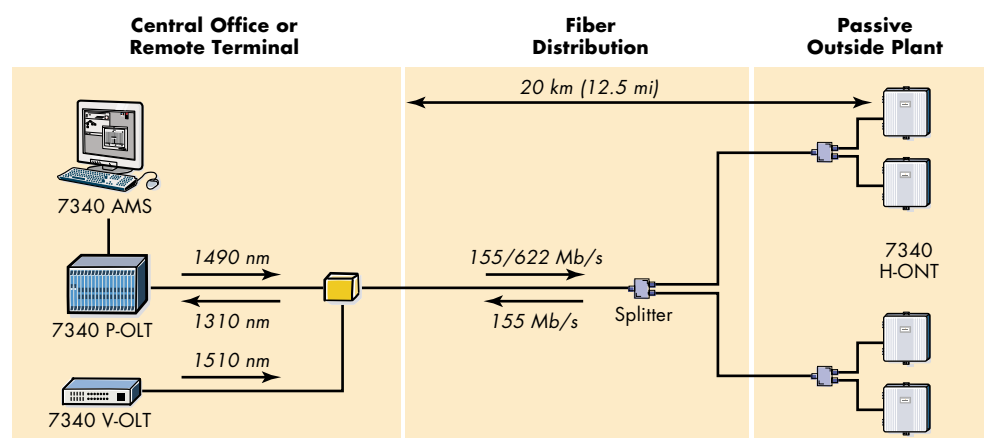
Alcatel 7340 FTTU H-ONT

The Alcatel 7340 FTTU architecture features an Alcatel 7340 H-ONT developed specifically for residential applications. The Alcatel 7340 H-ONT provides a full complement of functionality in an environmentally hardened package that is deployed on the outside of a subscriber's home.

The Alcatel 7340 H-ONT has an interface to the BPON fiber as well as twisted pair interfaces for voice, a 75 Ω coaxial interface to provide video service and a 10/100Base-T interface for data. Optionally, data can be supported using the home networking protocol defined by the Home Phoneline Networking Alliance (HPNA) over the twisted pair lines used to provide voice. The POTS service provides lifeline support through a battery backup in the power supply.



Figure 2: Alcatel 7340 FTTU BPON Technology



The full CATV spectrum from 40 - 850 MHz can be carried over the fiber, so there is plenty of room for such enhanced video services as premium channels, pay-per-view, Video on Demand and other interactive services

Alcatel 7340 FTTU V-OLT

The Alcatel 7340 V-OLT provides amplification of the video signal carried over PON creating a video overlay. It consists of a video transmitter and an Erbium Doped Fiber Amplifier (EDFA). The Alcatel 7340 V-OLT receives video content from the video source, and distributes it to the subscriber using the PON. The video overlay supports an extremely large number of channels. The video overlay allows both broadcast and interactive video services to be offered.

Alcatel Element Management System

Alcatel's access products — the Alcatel 7300 ASAM, Alcatel 7340 FTTU and Litespan — are an integrated product family managed at the element management level by the Alcatel Element Management Systems (the Alcatel 5528 Web-based Access Manager (WAM), the Alcatel

5526 AMS for the ANSI market, or the Alcatel 5523 AWS for the ETSI market). Alcatel provides an end-to-end solution with all the components for copper and fiber. Customers familiar with AMS or AWS for the Alcatel 7300 ASAM or Litespan can transfer that knowledge easily to the management of the Alcatel 7340 FTTU.

Alcatel's access management applications provide full support of industry-standard Telecommunications Management Network (TMN) architecture as defined by both Bellcore and applicable ITU groups.

The AMS software is a marriage of best-in-class, third-party software and Alcatel-developed runtime servers. It provides scalable and powerful element management functionality. The operator can view the equipment configuration and status,



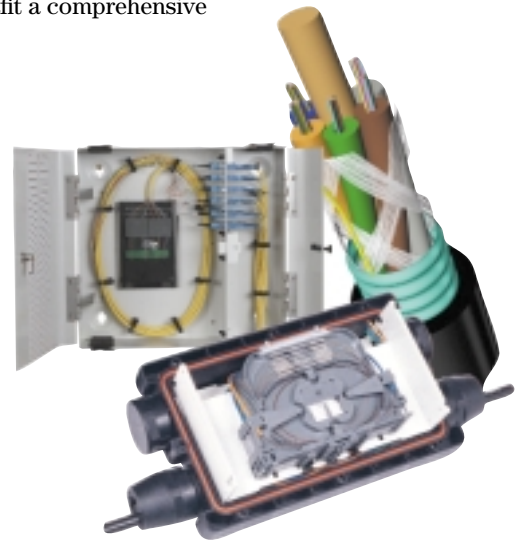
and can manage the end user services. Tools for fault detection and isolation, configuration management, performance monitoring, and security management provide the operator with a complete end-to-end view of the access network.

In the ETSI market, for the introduction of the Alcatel 7340 FTTU FGE1.0, the Alcatel 5528 WAM is offered as the management platform. The Alcatel 5528 WAM is an easy to manage web-based craft terminal that supports all Alcatel 7300 ASAM and Alcatel 7340 FTTU ETSI and ANSI equipment. In future releases, Alcatel's 5523 AWS, the scalable, market-leading element manager for fiber access, will be added as an optional element manager for the Alcatel 7340 FTTU.

Outside Plant

A major component of the Alcatel FTTU system is found in the outside plant. The outside plant consists of fiber optic cable, splicing enclosures, remote cabinets for patching, splicing and splitting/coupling, and optical splitters. These products are used in the feeder, distribution, and drop portion of the outside plant. The PON architecture consists of a point-to-multipoint system where the optical signal from the Alcatel 7340 P-OLT is split between multiple end users.

Alcatel's end-to-end capability supports the total PON network. Feeder, distribution, and drop fiber optic cable products, as well as a full connectivity product, are available to outfit a comprehensive FTTU solution.

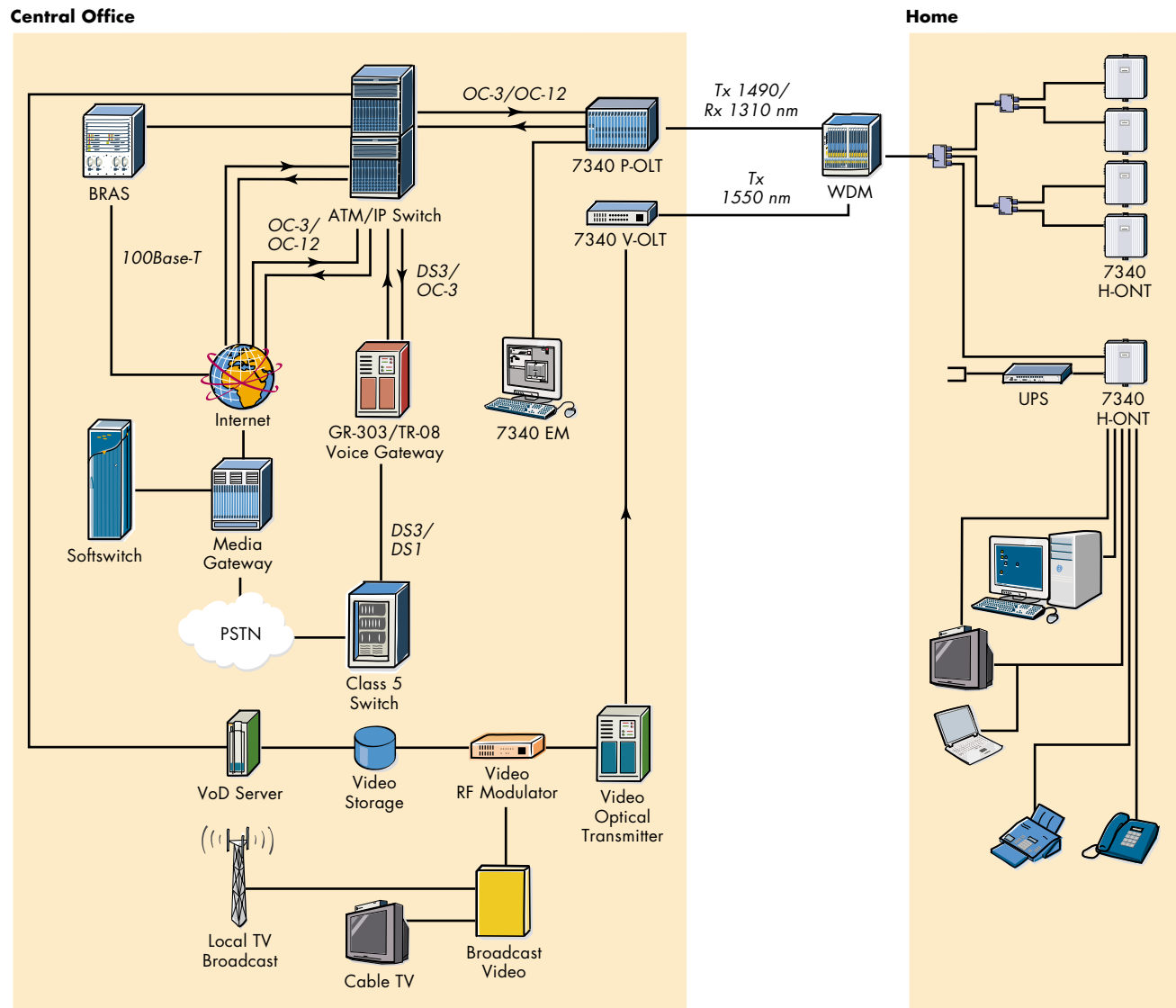


MARKET SEGMENTS

Optical technology has been widely deployed in the core of the network to increase network capacity, with widespread success. The access network (the last mile) became a bottleneck limiting the deployment of new services. Demand for broadband services has resulted in several

technologies being deployed on the existing copper-based access network to increase capacity. Where there is existing infrastructure, these copper-based solutions have been very successful. As operators look to the future, optical technology in the last mile meets the

Figure 3: FTTU Network Diagram



requirements of today while providing assurance that the network will be able to support the demands emerging in years to come. Figure 3 provides an FTTU network diagram.

The Alcatel 7340 FTTU is the ideal solution to provide the optical access network. When new network facilities are being installed, a network composed completely of fiber supports the services required today while positioning the operator very well for the future. For new build (greenfield) projects, the Alcatel 7340 FTTU is the ideal solution. The operator can offer any service mix that customers demand, while at the same time realizing the benefits of increased reliability and lower maintenance expenses that an all-optical network provides.

The Alcatel 7340 FTTU works very well for the overbuild network model. If an operator wants to build a new network to offer a service bundle of voice, high speed data and CATV to overlay on existing networks, FTTU provides numerous advantages over copper-based hybrid-fiber-coax

(HFC) solutions. The HFC network is limited in the amount of capacity and service growth possible in the future, whereas the capabilities of the optical network are virtually unlimited.

Complete End-to-End Solutions

Alcatel has designed the Alcatel 7340 FTTU to provide an all-optical access solution that gives service providers the ability to offer any service mix their customers demand, while realizing the benefits of increased reliability and lower maintenance expenses. This scalable multimedia service solution serves a broad range of fiber-to-the-user applications including residential, small office/home office, multiple dwelling units, and small business.

Alcatel provides all of the elements required to implement complete end-to-end network solutions. Alcatel is uniquely positioned to bring this wide array of products and expertise to its customers, ensuring a solution that provides the maximum benefit for the customer.

As operators look to the future, optical technology in the last mile meets the requirements of today while ensuring the network can support emerging demands for years to come



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TECHNICAL INFORMATION GUIDE

Alcatel 7340 FTU

Fiber to the User

Release 1.0 ANSI (FGH1.0)/
Release 1.0 ETSI (FGE1.0)



ARCHITECTS OF AN INTERNET WORLD



Introduction

The Alcatel 7340 Fiber to the User (FTTU) solution delivers the next generation of broadband services today. Capitalizing on Alcatel's industry leadership in wireline digital subscriber line (DSL) and next generation digital loop carrier (NGDLC), and wireless local multipoint distribution service (LMDS) broadband access technologies, the Alcatel 7340 FTTU expands Alcatel's access portfolio with an all-optical access solution. The Alcatel 7340 FTTU allows established and emerging service providers to supply revenue generating services to their residential customers, including high quality voice and multi-channel video services, while providing high speed Internet access at over 3,000 times the speed of traditional dialup modems. Small business customers can be served by the same system, minimizing the varieties of equipment an operator must deploy, and the support services required. The Alcatel 7340 FTTU is a flexible solution that extends optical access across the last mile of the communications network, supporting broadband services today and into the future.

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Product Description

The Alcatel 7340 FTTU solution consists of multiple elements:

- > *Alcatel 7340 FTTU Packet Optical Line Terminal (P-OLT)*
 - Provides the network interface for the passive optical network (PON)
- > *Alcatel 7340 FTTU Home Optical Network Terminal (H-ONT)* – Provides customer interfaces
- > *Alcatel 7340 FTTU Video Optical Line Terminal (V-OLT)* – Distributes video across the PON
- > *Alcatel Element Management System, AMS (ANSI) or AWS/WAM (ETSI)* – Provides element management
- > *Outside plant* – Provides fiber distribution consisting of fiber cables and optical components for a completely passive network

The Alcatel 7340 FTTU solution uses a single fiber to connect the OLT equipment in the central office (CO) to the ONTs located at the subscriber location. Because fiber has a low loss characteristic, the coverage span from the CO to the subscriber is very large – up to 20 kilometers or 12.4 miles. When longer distances must be covered, the OLT can be

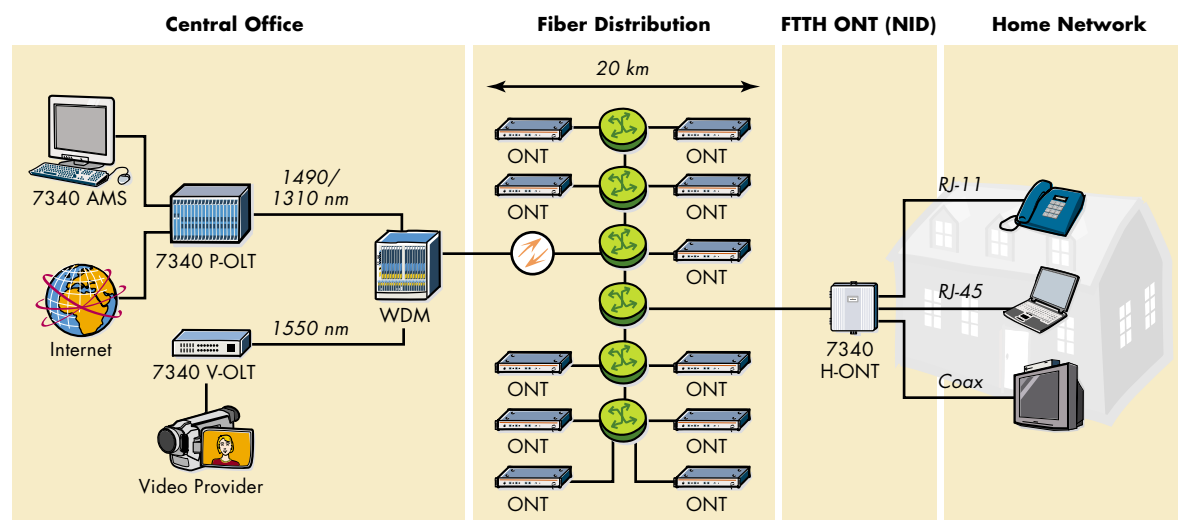
located remotely. Each fiber from the CO carries one PON and can be shared by up to 32 subscribers using optical splitters, reducing the cost of the fiber plant supporting each subscriber. The Alcatel 7340 FTTU solution supports 622/155 asymmetrical PON operation, as defined by the ITU-T G983 BPON standard.

Figure 1 provides an illustration of the Alcatel 7340 FTTU system.

Wavelength division multiplexing (WDM) supports bidirectional transmission over a single fiber. Packet data is carried between the Alcatel 7340 FTTU P-OLT and the ONTs using two wavelengths: 1490 nm in the downstream direction using a time division multiplexing (TDM) protocol and 1310 nm in the upstream direction using a time division multiple access (TDMA) protocol.

A third wavelength at 1550 nm is used to carry broadcast video from the Alcatel 7340 V-OLT to all H-ONTs. This 1550 nm wavelength is transparent to the Alcatel 7340 P-OLT bandwidth for carrying voice and data. With 4-6 Gb/s of video bandwidth,

Figure 1: The Alcatel 7340 FTTU System



subscribers can be provided with analog, standard digital TV, HDTV, and Video on Demand (VoD) with hundreds of channels of content.

An optical coupler is used to combine the wavelengths carrying the packet and video data onto a single fiber for distribution across the access network.

Alcatel 7340 FTTU P-OLT

The Alcatel 7340 P-OLT functions as an optical access multiplexer, performing concentration and grooming of broadband packet traffic between the core network and the subscribers, as well as providing the end user BPON and network-side interfaces. It is extremely scalable, allowing a small system to be deployed to support a small subscriber population cost-effectively, while being able to grow to a high-density configuration for large deployments. The Alcatel 7340 FTTU P-OLT consists of a single shelf with multiple plug-in cards. The backplane has over 10 Gb/s of bandwidth capacity, ensuring that the Alcatel 7340 FTTU P-OLT is capable of supporting current and future applications.

Figure 2 illustrates the Alcatel 7340 P-OLT.

Figure 2: The Alcatel 7340 FTTU P-OLT



An alarm control unit (ACU) provides TIA/EIA-232 and 10Base-T interfaces for connection to the network management system, and it performs alarm and control processing and reporting for the Alcatel 7340 P-OLT and connected Alcatel 7340 ONTs. Connection to the core network is provided by network termination (NT) cards typically deployed in a 1+1 protection configuration. The NT cards use an OC-3c/STM-1 SONET interface, and are OC-12c/STM-4 SONET upgradeable. System software and the Alcatel 7340 P-OLT profile are stored in the NT card and downloaded to other cards when the system is powered on.

The BPON interfaces are supported using PON line termination modules (PLT-2), which support two PON terminations per module. The PLT-2 module has two PON ports for connection to the ONTs. Up to 18 PLT-2 modules can be installed in a single shelf. Using the 32 split of the PON, a single shelf P-OLT will support up to 1,152 subscribers.

A great advantage for Alcatel and Alcatel 7340 FTTU customers is that elements such as the ACU, NT, and the backplane are also used by the market-leading Alcatel 7300 Advanced Service Access Manager (ASAM).

Alcatel 7340 FTTU V-OLT

The Alcatel 7340 V-OLT provides amplification of the video signal carried over PON on the dedicated 1550 nm wavelength, creating a video overlay. It consists of a video transmitter and an Erbium Doped Fiber Amplifier (EDFA), which Alcatel sources from a best-in-class video vendor partner.

The Alcatel 7340 V-OLT receives video content from the video source (head-end) and distributes it to the subscriber using the PON. The video overlay supports a large video spectrum so an extremely large number of channels can be carried. The full Cable TV (CATV) spectrum from 47 MHz to 862 MHz is available, and the spectrum can be extended to over 2 GHz,

allowing direct station select (DSS) services to be carried as well. Since the overlay is transparent, any coding scheme can be carried, including AM-VSB, QAM64/256, QPSK or MPEG directly.

The video overlay allows both broadcast and interactive video services to be offered. Interactive video requires a return channel to carry commands from the subscriber to the video head-end and, with the Alcatel 7340 FTTU, this data is carried over the PON. The Alcatel 7340 V-OLT is typically configured to drive about 17.5 dBm per port, which is sufficient power to feed multiple PONs depending on the channel mix and span of the access fiber.

Alcatel 7340 FTTU H-ONT

The Alcatel 7340 FTTU H-ONT has been optimized for residential services, but is also quite applicable for small businesses. It terminates the PON at the residence, providing the application interfaces that enable subscriber services. The Alcatel 7340 H-ONT is environmentally hardened for external installation, but can be installed inside buildings as well. The Alcatel 7340 H-ONT has separate operator and user access areas to support a network point of demarcation.

Figure 3 illustrates the Alcatel 7340 H-ONT.

The Alcatel 7340 H-ONT has multiple interfaces to support voice, data and video services. Since subscribers regularly use these interface types today, existing customer premises equipment (CPE) can be used. Voice service is supported on four plain old telephone service (POTS) interfaces using RJ-11 connectors. Video service is distributed using a single 75 Ω coaxial "F" connector. This would then be split using an external coaxial splitter like CATV for residential distribution to multiple TVs. High speed Internet can be delivered either through a 10/100Base-T interface or by using the 10 Mb/s Home Phoneline Networking Alliance (HPNA) 2.0 protocol.

The 10/100Base-T uses an RJ-45 connector, while HPNA is supported on the POTS interfaces (concurrently compatible with the voice service).

The Alcatel 7340 H-ONT is powered using an uninterruptible power supply (UPS) mounted in an environmentally controlled area (such as, in a house, garage, or basement). The UPS uses 120 V AC or 220 V AC as its power input and powers the Alcatel 7340 H-ONT with a low voltage 12 V DC feed. During normal operation, the UPS uses local AC power, but in the event of a power failure, continues to power the ONT through a battery. During an AC power loss condition, the Alcatel 7340 H-ONT powers off the video and data interfaces to conserve power for the POTS lines, providing over eight hours of battery backup operation for lifeline voice service. The standard UPS battery uses sealed lead acid technology with a typical life span of about seven years when installed in a controlled environment. The UPS continually monitors both the power condition and status of the battery, which are reported to the network manager through the Alcatel 7340 H-ONT.

Figure 3: The Alcatel 7340 FTTU H-ONT



Alcatel 7340 FTTU Access Management

Alcatel's access products — the Alcatel 7300 ASAM, Alcatel 7340 FTTU and Litespan — are an integrated product family managed at the element management level by the Alcatel Element Management Systems (the Alcatel 5528 Web-based Access Manager (WAM), Alcatel 5526 AMS for the ANSI market, or the Alcatel 5523 AWS for the ETSI market). Alcatel provides an end-to-end solution with all components for copper and fiber. Customers familiar with AMS or AWS for the Alcatel 7300 ASAM or Litespan can transfer that knowledge easily to the management of the Alcatel 7340 FTTU.

Alcatel's access management applications provide full support of industry-standard Telecommunications Management Network (TMN) architecture as defined by both Bellcore and applicable ITU groups.

The AMS software is a marriage of best-in-class, third-party software and Alcatel-developed runtime servers. It provides scalable and powerful element management functionality. The operator can view the equipment configuration and status, and can manage the end user services. Tools for fault detection and isolation, configuration management, performance monitoring, and security management provide the operator with a complete end-to-end view of the access network.

In the ETSI market, for the introduction of the Alcatel 7340 FTTU FGE1.0, the Alcatel 5528 WAM is offered as the management platform. The Alcatel 5528 WAM is an easy to manage web-based craft terminal that supports all Alcatel 7300 ASAM and Alcatel 7340 FTTU ETSI and ANSI equipment. In future releases, Alcatel's 5523 AWS, the scaleable market-leading element manager for fiber access, will be offered as an optional element manager for the Alcatel 7340 FTTU.

Outside Plant Architecture

The outside plant consists of fiber optic cables, splicing enclosures, fiber distribution cabinets/enclosures and drop boxes. The outside plant can be implemented using numerous architectures, and the solution selected can greatly affect the cost of deployment.

Key factors that significantly influence the solution and related costs include type of plant (aerial or buried), density of homes, location of splitters, expected penetration rates, among others. The optimal architecture for a particular network deployment can vary, but a typical system will use two levels of distribution and splitting. A primary flexibility point provides rough granularity for splitting the fiber, followed by a final drop or secondary flexibility point where the final split and drops to the homes are implemented. This basic architecture provides a cost-effective solution while retaining flexibility for the future. An example of an FTTU architecture using a full Alcatel 7340 P-OLT is shown in Figure 4.

Product Applications

The Alcatel 7340 FTTU solution allows operators to offer a robust bundle of voice, data and video services to their customers. Being able to offer a service bundle provides both the operator and customer with numerous benefits:

Customer Benefits	Operator Benefits
Single bill	Single network carries all services
Better service interoperability	Bandwidth shared by multiple services
Package discounts	Single management system
Single customer support number	Easier to offer blended services
Access to more services	Eliminates subscriber churn

Alcatel 7340 FTTU Release 1.0 ANSI (FGH1.0)/Release 1.0 ETSI (FGE1.0)

Operators can offer voice, data and video bundles today, secure in the knowledge that, as new services emerge, the FTTU network will be able to support them. Customers may not know they are being served with a next generation technology, but their satisfaction level is increased. Now that they have four phone lines, they can connect a computer to the Internet at speeds much faster than before. Their existing televisions also have more channels and new services.

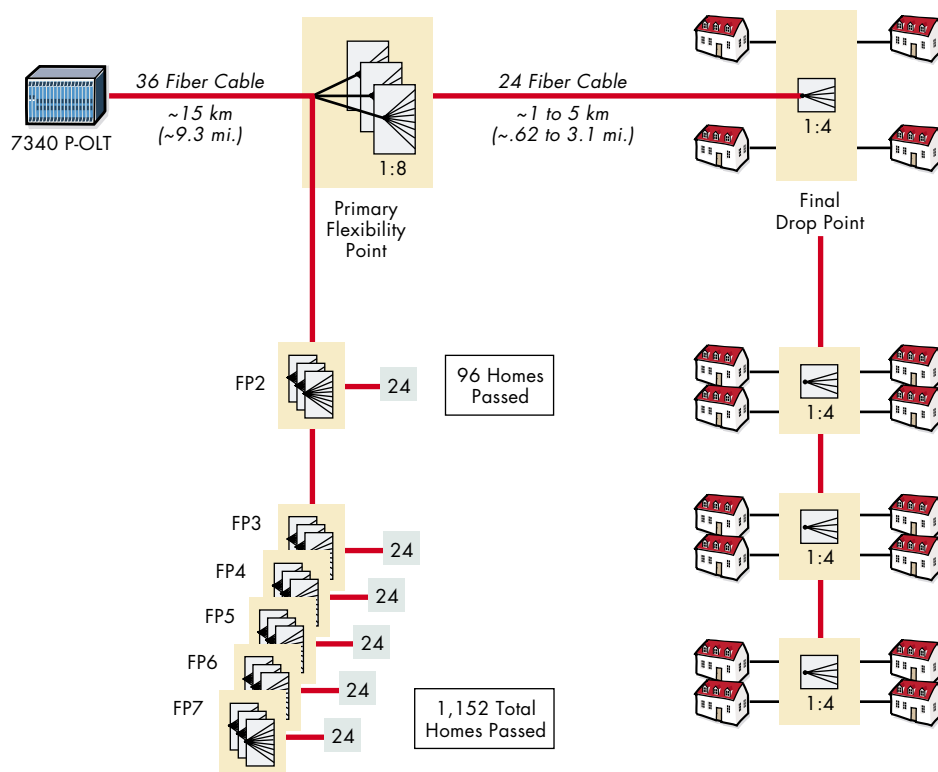
Data

The Alcatel 7340 FTTU solution offers very high speed Internet access to each user, providing the bandwidth to support new revenue generating services. Because video is carried over a dedicated overlay, the entire bandwidth of the PON is available for voice and data. Voice traffic consumes only a small portion of the PON bandwidth, allowing the subscriber to realize

extraordinary Internet access speeds for new high bandwidth services such as interactive gaming. Subscribers can be provided with Internet access service levels ranging from 64 kb/s to 40 Mb/s (with a line rate of 622/155 Mb/s), supporting tiered service level agreements (SLAs). Both constant bit rate (CBR) and unspecified bit rate (UBR) classes of service can be implemented to provide the highest levels of flexibility and operational control for the operator.

Distribution of data within the home is an important consideration, so Alcatel offers two home networking options on the Alcatel 7340 H-ONT. 10/100Base-T is a very popular networking technology and many users are familiar with it, so it is directly supported through an RJ-45 connector. This technology requires Cat-5 cabling, which is available in many new homes and has been installed in some existing homes as well. The

Figure 4: Access Management



connection between the Alcatel 7340 H-ONT and the home PC is a simple Cat-5 connection. If multiple devices will be connected on the home LAN, an inexpensive hub would be installed.

Because many homes do not have CAT-5 cable, and it increases the deployment costs, Alcatel has also implemented an HPNA interface on the Alcatel 7340 H-ONT. HPNA is a standardized protocol that uses existing telephone wiring to support a 10+ Mb/s LAN. Phone service on the wiring is not affected. This is a hubless technology, so multiple devices can connect directly without the addition of an external hub. Alcatel provides home networking options that give operators deployment flexibility.

Voice

The Alcatel 7340 FTTU supports four POTS lines with toll-quality service to each residential subscriber. With the battery backup capability provided by the UPS, lifeline service is achieved. Subscribers receive the high quality phone service they expect, while the operator receives the flexibility and bandwidth savings realized through packet-voice technology.

This voice service is implemented using voice over ATM (VoATM) technology carried over the PON. The Alcatel 7340 H-ONT performs the voice processing necessary to interface the analog POTS with the VoATM protocol. The PON and Alcatel 7340 P-OLT provide the transmission pipe between the Alcatel 7340 H-ONT and an external voice gateway, providing the interface to the public switched telephone network (PSTN). The Alcatel 7340 H-ONT performs the voice processing in software, allowing support of new voice-over-packet (VoP) protocols (SIP, Megaco/H.248) as they become available. Support for new voice services can be downloaded to the Alcatel 7340 H-ONT, so enhancements can be made remotely using the Alcatel 7340 element managers. This capability ensures that if the network VoP technology changes, the Alcatel 7340 H-ONTs will continue to operate.

Video

The Alcatel 7340 FTTU offers more video capabilities than other technologies through the use of the dedicated video overlay. Hundreds of channels of analog, digital and HDTV programming can be offered to subscribers, opening up significant opportunities for new service revenues. Many enhanced video services such as premium channels, pay-per-view, VoD, and other interactive services can be delivered to each subscriber. For an operator entering a new market in which there is an incumbent video provider, the Alcatel 7340 FTTU is the ideal solution.

Subscribers can be provided with robust video service without having to install set-top boxes for each television, so the basic service price is comparable to that of the existing provider. With a large amount of video spectrum available on the overlay, a plethora of other channels and services can be offered to gain competitive advantage over the video competitor, satisfy the consumer, and generate additional revenues. The Alcatel 7340 FTTU solution also positions the operator well for the future when bandwidth-hungry HDTV service deployments expand and stress legacy networks, since these can easily be supported on the overlay.

The Alcatel 7340 FTTU H-ONT provides a standard video output that is directly compatible with existing television equipment. Sufficient power is provided so the output can be externally split and still drive four TVs in a typical home. The video port on any Alcatel 7340 H-ONT can be disabled through software from the Alcatel 7340 AMS, so video service can be well controlled.

Product Features and Benefits

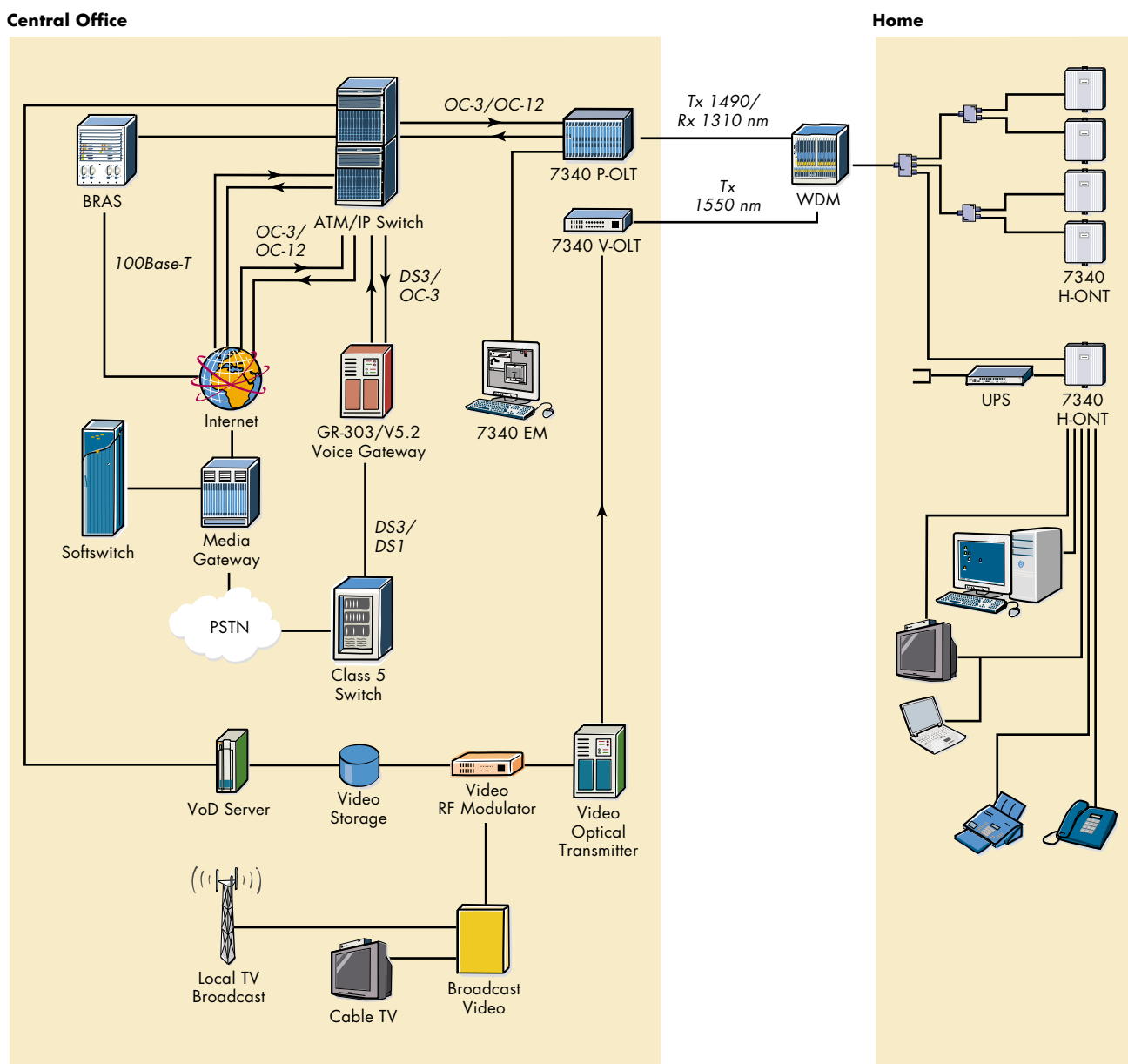
Feature	Function	Benefit
PON architecture	<ul style="list-style-type: none"> • Completely passive outside plant • FSAN/ITU-T G.983 design • Single fiber solution • 32 subscriber split per fiber • 20 km (12.4 mile) reach • Robust ATM quality of service 	<ul style="list-style-type: none"> • Reduced maintenance expense • Increased network reliability • Standards-based components provide cost savings • Sharing of fiber for reduced network capital expenditure • QoS supports high quality services
ONT optimized for broadband residential service	<ul style="list-style-type: none"> • Supports bundled services (voice, video, and data) • Hardened, low profile network interface device (NID) • Virtually unlimited capacity 	<ul style="list-style-type: none"> • Easily attracts new customers • Reduces customer churn • Maintains demarcation point outside house • Ensures support for future services
OLT designed to be flexible and scalable	<ul style="list-style-type: none"> • Highly scalable • Residential and business services supported • Component commonality with 7300ASAM (shelf, NT interface and ACU), and 7301 ASAM is open to FTU/PON access technology 	<ul style="list-style-type: none"> • Cost-effective for small deployments • Scales well to high density for large deployments • Different customer types supported on one system • Robust management system
Video services	<ul style="list-style-type: none"> • CATV • DBS • Baseband (digital) • Broadcast video on demand (VoD) • HDTV 	<ul style="list-style-type: none"> • Competitive with MSO offerings • High capacity and flexibility for enhanced services • Multiple video deployment options • Increased revenue opportunity
Voice services	<ul style="list-style-type: none"> • Toll-quality voice • Supports CLASS (caller ID, call waiting, voice messaging) • Fax machine support • Answering machine compatible 	<ul style="list-style-type: none"> • Subscribers' quality and reliability expectations fully met • Easily provisioned through Alcatel Element management systems • Flexible (four POTS lines) • Supports VoATM and VoIP
Data services	<ul style="list-style-type: none"> • 10/100Base-T LAN • HPNA 1.0 – 10 Mb/s • Provisionable bandwidth 	<ul style="list-style-type: none"> • Very high speed data up to 40 Mb/s per subscriber • Simple installation and easy operator maintenance • HPNA runs on standard twisted-pair cabling

Complete End-to-End Solutions

The Alcatel 7340 FTTU solution comprises the access portion of the overall network. Alcatel provides virtually all of the elements required to implement a complete network solution, including the outside plant components, to supply an end-to-end network solution. See Figure 5.

Alcatel is uniquely positioned to bring this wide array of products and expertise to its customers, ensuring a solution that provides the maximum benefit for the customer.

Figure 5: FTTU Network Diagram



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